carrying arm of the *remontoire* is attached a small chain or wire, which communicates any motion it may have to the lever, L, from the other end of which lever hangs a weight, *w*, smaller than W, which weight is therefore raised when the *remontoire* arm is lowered, and lowered when the *remontoire* arm is raised; Q is a disk of metal on a vertical spindle of a uniform motion clock, and revolving rapidly (say 300 per minute). When the weight, W, is below its mean position, it is in contact with the disk Q, and (the lower end of it being coated with leather) produces a considerable amount of friction, and therefore tends to retard the speed of the clock; when the weight, W, is above its mean position, it is altogether out of contact with the disk Q. The action is as follows: Supposing the shaft, A, to be revolving exactly one per minute, the pendulum to be vibrating exactly 60 per minute, and that there are 30 teeth in the scape-wheel, it is evident that the *remontoire* arm, and therefore, the weights, W and *w*, will vibrate backwards and forwards the same distance each second, and that the mean position of all will be the same each second. Under these circumstances, the weight, W, will be alternately 0·5 second in contact with the disk Q, and 0·5 second out of contact, and the uniform motion clock is rated, *per se*, just so much fast, that the resting of the weight, W, for 0·5 second in each second, will bring the rate right.

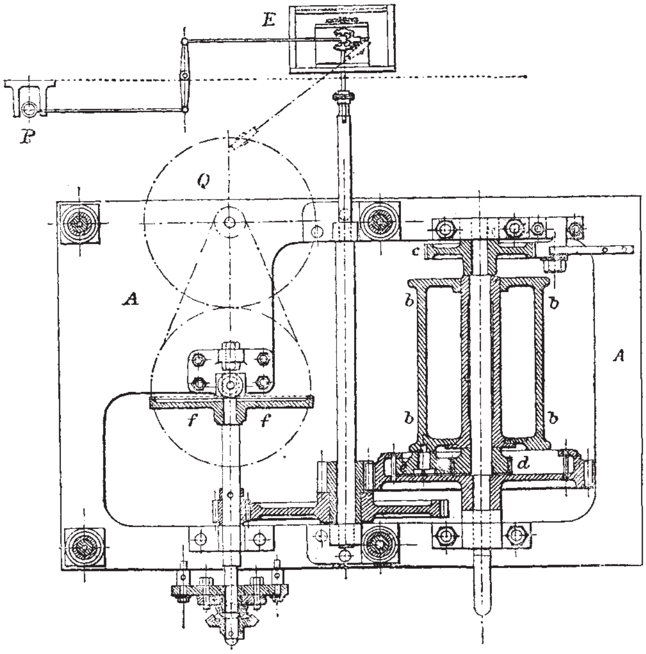

Fig. 3.

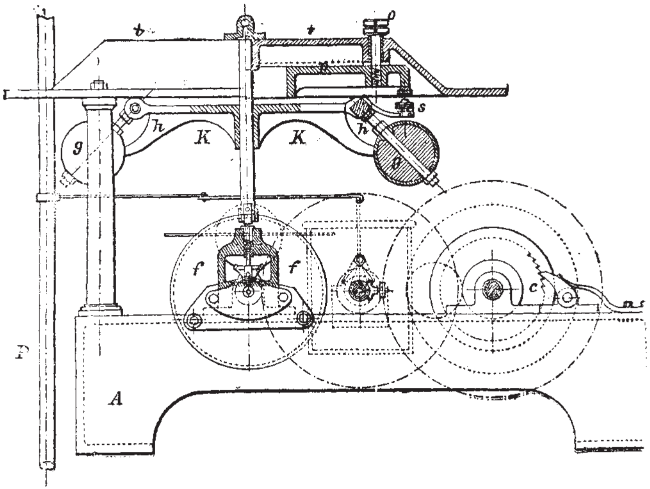

Fig. 4.

Now, suppose an error of acceleration to arise in the uniform motion clock, the mean position of *remontoire* arm will rise; therefore W will fall, and, instead of rubbing in contact with Q for 0·5 second, it will rub for 0·6 or 0·7 second, according to the extent of the error. This will tend to check the rate, and this check will continue till the relative position of the uniform motion shaft becomes as it was when the clock was going correctly.

If a retardation occurs, the reverse effect will take place, and the weight, W, will rub only for 0·4 or 0·3 second, instead of 0·5, until the error be corrected.

So far as described, there was no particular novelty, as most of this arrangement, in principle, had been tried before, the failure that had resulted being due to the fact that it was found impossible to prevent the pendulum being influenced by the difference of force on the pallets, under varying circumstances, the pendulum being in the former case driven by the scapement; not by electricity, as in this case.

This difficulty was got rid of by:—

(1) Making the pallets (as they are not required to drive the pendulum) of such form that the teeth of the scape-wheel impinge upon them nearly at the angle of repose.

(2) By driving the pendulum by electric current from another clock, thus virtually rendering the pendulum not a pendulum at all, but a lever worked backward and forward by electricity, and not subject to alteration in its rate by slightly varying force on the pallets.

An arrangement is also attached (but not shown in the figure, to avoid confusion) by which, if either portion of the clock fails to do its duty from want of winding, want of electric current, or other cause, the connection between the two systems is instantly severed, automatically.

(*To be continued.*)

NOTES.

Mr. Griesbach, of the Geological Survey of India, who has lately been engaged in geological work in Afghanistan, and who was geologist to the Afghan Boundary Commission, has been appointed to Beloochistan, "to carry on geological investigations into the mineral deposits of the country."

At the meeting of the British Association at Newcastle there will be a joint discussion by Sections B and G of a paper to be read in the latter Section by Sir I. Lowthian Bell, F.R.S., President of Section B, on "Blast Furnace Practice."

The International Astronomical Congress will hold its sittings in Brussels from the 10th to the 12th inst., and at Liége on the 13th. The attendance from all European countries and America will, it is anticipated, be very large.

It is reported from Brussels that M. Dutoit, the Transvaal Minister of Public Instruction, is now endeavouring in Belgium and Holland to recruit the necessary staff for organizing a Dutch University in Pretoria, the capital of the Transvaal.

Colonel Thuillier's report on the progress of the Survey of India for the past year shows that the party employed on the trigonometrical surveys has completed the 370 miles remaining of the secondary triangulation along the east coast of India. The secondary triangulation was also carried out for an aggregate length of 270 miles by parties employed in Beloochistan as a basis for topographical surveys in that region. The work of the geodetic party comprised measurement of seven arcs of longitude in Southern India, and the tidal survey party continued its observations with self-registering tide-gauges at several stations along the coast, where tidal observatories are established, and connected with the operations of spirit levelling. Geographical surveys have been carried out vigorously in Upper Burmah, nearly 21,000 square miles having been surveyed and mapped on a half-inch scale. Reconnaissance along the Nepal boundary has supplied a rough basis for a more accurate and detailed survey of the northern frontier when an opportunity offers. Interesting additional information regarding Bhootan and Tibet has been obtained from the adventurous travels of native explorers trained and sent thither by the Department. Of the new maps 4062 were published during the year, and heavy demands continue for trans-frontier maps, and maps of Upper Burmah. The photographic and lithographic offices show the large out-turn of 1,203,861 copies during the year, including high class illustrations for archæological and other reports.

A RECENT mail from New Guinea brings information that the Italian naturalist Signor Lorie had landed in that country, and was proceeding to carry out arrangements for a scheme of scientific investigation which he proposed to himself. His present intention is to remain for several years in New Guinea, where he intends, in addition to following his favourite scientific pursuits, to devote some of his time to exploration work. Signor Lorie is described as a great enthusiast, and a man of determination and courage.

THE *American Meteorological Journal* for August contains an instructive article, by Prof. W. Ferrel, on decrease of temperature with increase of altitude. The author reviews the cases of rapid decrease which would occur were the atmosphere without aqueous vapour and in a stable state; of the very low temperature that would exist a little above the earth, if there were no atmosphere; of the low temperature of the upper atmosphere, owing to radiation into space, if the earth were surrounded by a clear atmosphere, not heated by the solar rays. The very rapid decrease of temperature with height is prevented by the ascending currents, caused by unstable equilibrium, and by the heat of condensation given out after the vapour has ascended to the altitude where condensation commences. The average vertical gradient is less in the cloud region than in the lower strata of the atmosphere, and less in the lower strata in cloudy than in clear weather, as shown by the results of Glaisher's balloon observations. He also refers to the more frequent unstable state of the atmosphere in spring and early summer, owing to the lower strata at that season being warmed up faster than the upper strata; in the fall of the year the unstable state is not so readily produced, and more settled weather prevails. Mr. H. H. Clayton has a paper on diurnal and annual oscillations of the barometer. It is pointed out, in the report of the expedition to Lady Franklin Bay, that if the diurnal pressure at five Arctic stations differing largely in longitude be plotted in simultaneous time, the epochs of maxima and minima show a striking coincidence with each other; the author traces the probable cause of the occurrence of the maxima to the expansion and overflow of air from Asia and America to the Pole; and of the minima at the Pole to the fact that the outflow from the Pole towards those continents is not replaced by an influx in that direction from the oceans. The retardation of the annual maximum from the Arctic region to the Equator, and of the minimum from the southern parts of the continents to the Arctic region, is also attributed to the relative heating and cooling of the continents and oceans. The remaining articles are: on the mineral waters of Gratiot County, Michigan, by Dr. Brainerd, giving an analysis of the waters and the virtues of the substances contained in them; the State tornado charts of Kansas and Indian Territory, by Lieut. Finley; a translation of a paper, by Saussure in 1796, on the use of the sling psychrometer, from which has resulted the modern use of that instrument; and, on atmospheric economy of solar radiation, by A. Searle, with comments by Prof. Ferrel (the principal point is that the earth is kept at a higher temperature than it would be, owing to the fact that heat is transferred upwards by conduction and convection instead of by direct radiation).

THE syllabus for the year 1889-90 of the Manchester Technical School has been issued. It shows the importance and magnitude of the work in which this institution is engaged. There are eight departments in the day and ten in the evening school, beginning with a manual training school for boys, which is the beginning of the whole course. This school is not intended to teach boys a trade, but to provide them with a complete education of both head and hand, in the belief that in this way their powers will best be developed and they themselves be best fitted for after-life. The syllabus this year has some new features. In manual training there is a special course on Saturday mornings for schoolmasters and teachers in the use of wood-working tools, with a view to enable them to introduce manual training among their own pupils. In commercial geography there is to be a special course of lectures of a practical character. Type-writing is another novelty. The chief feature is instruction in the use of the Remington and Caligraph machines. With a view to obtain the necessary skill, each student has three hours' practice per week. There is a special class for women in shorthand, in addition to increased facilities for male students. A special honours class has been formed for evening students in magnetism and electricity, telegraphy, and electric lighting. Especially it should be noted that facilities are offered for a comprehensive study of commercial subjects. There are now great facilities to evening students for the study of science and of art in their application to all the more important industries. The school staff consists of 52 teachers. Last session the school was attended by 3328 individual students.

WE have received the prospectus of the day classes in arts and science and of the evening lectures for the session 1889-90 of the University College, Liverpool.

THE Colonial Board of Viticulture in Melbourne recently proposed the establishment at public expense of an experimental vineyard and school of viticulture for the colony. The suggestion has now been accepted by the Minister of Lands, and a site has been selected for the purpose at Rutherglen. The area selected is 200 acres, and it will be permanently reserved for the purpose. Instruction will be imparted at the institution by capable teachers in the most approved methods of vine cultivation, and experiments will be conducted with the view of testing the value of new plants said to be suitable for growth in Victoria. Funds for conducting the school will be provided in the present year's estimates, but pending the formal vote the Minister has authorized the expenditure of a sum sufficient to at once plant 20 acres of the reserve, and so expedite the work. This will enable the Board of Viticulture to take advantage of the present favourable season.

IN his last Report, the British Vice-Consul at Nisch mentions the terrible havoc which is being made by disafforestation in Servia since its independence. He says that during the Turkish occupation Servia was covered with magnificent forests of oak, beech, chestnut, and walnut trees, by means of which the country was assured of a regular and plentiful supply of water, and in the recesses of which the natives found shelter and refuge from their foreign conquerors. From the date of her independence a destruction of these invaluable treasures commenced which has been carried on with remorseless and unreflecting perseverance, and it appears as though there were at the present day a race against time to complete the havoc. From time to time the consciences of Ministers and Governments have roused them to interfere, but, beyond passing laws which remain a dead letter, hardly anything has been done to arrest the evil. Floods in winter and drought in summer were declared by Mr. Borchgrave, in 1883, to have already begun to exact the penalty which carelessness or want of foresight must be called upon to pay; but the peasant and his goats continue their work of destruction, whilst the authorities are apparently more anxious to avoid occasions of discontent which restrictive measures would create than of applying such remedies as legislation has placed in their hands. Whole mountains may be seen completely denuded of timber, with the exception of a low worthless scrub, which were, a few years ago, covered with woods, but which have fallen victims to the innumerable herds of goats which are allowed to browse at will. The peasants amongst whom the land was divided at the time of the Servian independence have cleared vast tracts for the purposes of agriculture, and possess the right of cutting timber for firewood in those forests which are under the management of the different *communes*. Very little coal is used for household purposes, and the amount of wood required for daily consumption adds enormously to the drain on the national resources. The best-wooded parts of Servia are the districts of the south and south-east, but especially the department of Toplitza, which may be said to contain the only remaining virgin forests of Servia, and whence are annually drawn large supplies of walnut trunks and oak staves for casks. The heights of the Nischava Valley, Stalatz, and Krushevatz furnish excellent building timber. Oak forests are abundant on the Turkish frontier of Vrania. Walnut trees, which attain to an enormous growth, have been mercilessly dealt with, the value of this timber having attracted the attention of Austrian merchants, who send agents to choose and cut the wood for exportation. The fir and juniper are found in the central and western valleys, and on the great Kopavnik Range on the south-east, the pine on the heights of Zlatibor.

HERR TROGNITZ contributes to the last issue of *Petermann's Mitteilungen* the results of calculations which he has made of the areas of the various South American States. These are based on the maps in the latest edition of Stieler's Atlas, which are compiled from the latest official and other information. The figures are in square kilometres.

Brazil	8,361,350
French Guiana	78,900
Dutch ,,	129,100
British ,,	229,600
Venezuela	1,043,900
Columbia	1,203,100
Ecuador	299,600
Peru	1,137,000
Bolivia	1,334,200
Chili	776,000
Argentine	2,789,400
Uruguay	178,700
Paraguay	253,100
Total	17,813,950

THE *Colonies and India* reports from Tasmania that a movement is on foot in Hobart for the creation of a University. A notice of motion directing attention to the desirability of such a step was given in the Council of Education by the Minister of Education, and the subject was to be considered at a meeting on June 19. "We hope to hear that it has been favourably considered, as the colony is quite prosperous enough to maintain such an institution, and it would be one which would be extremely useful, as well as being to some extent an adornment to the picturesque capital of the Island Colony."

MR. G. W. ROOSEVELT, American Consul at Bordeaux, in a report on the treatment of diseases of vines in France, says that in spite of the numerous inventions meant to destroy Phylloxera, it still continues its ravages. One of the most recent plans is that of an American, Mr. L. H. Davis, who inoculates the vine, through a carefully made excision, with a preparation which he claims is destructive to the Phylloxera, while it leaves the vine uninjured. It is too soon yet to speak of the results of this plan. Dr. Griffin advocates a distribution by a machine constructed by him of a substance which can be used in either a dry or a liquid state. Last spring he operated on a vineyard placed at his disposal by the French Government, and had the satisfaction of seeing the vines treated by him sound and healthy, while other plants in the same vineyard were perishing. The most generally employed remedy has been found to be very serviceable, and free from the danger that was thought to follow it—that is, the submersion for not less than forty days in carbon of sulphur dissolved in water. In light permeable soils a strong mixture is used, but on hard soils a weaker solution is better. Within the past few years the actual area of the vines destroyed by this pest is 1,200,000 hectares, or, roughly speaking, one-half of the vineyards of France; and if we remember that a hectare of vines is worth about 6000 francs we can see what a terrible loss France has suffered. In the case of Oïdium, as in that of Phylloxera, no positive remedy has yet been discovered, but the usual mode—that is, the application of sulphur, pure or mixed—checks the disease, and at the same time helps the growth of the vine. In fact, so great have been the good results of the use of sulphur, that it will for the future be used in most vineyards, even where Oïdium does not exist. Till the year 1885 no remedy was known for mildew. Since that year, however, salts of copper have been successfully employed, though there is some doubt whether that substance is really beneficial to the vineyards. The most general method is to pluck off the diseased leaves and burn them. Besides these there are other methods, such as the use of *bouillie bordelaise*, *eau céleste*, ammoniate of copper, and verdigris with powdered sulphate of copper. On account of the recent appearance of the disease called black rot, no satisfactory remedy has yet been tried. With regard to anthracnose, if steps are taken early in the spring, the disease may be brought under control. Perhaps the best remedy is a mixture of lime and sulphur. A first sulphuring is given when the shoots are four or five inches long; then, if lesions appear, the operation is repeated in about a fortnight with a mixture of lime and sulphur, the proportion being one part of sulphur to three of lime. A mixture of plaster and sulphate of iron has also been very successful. The only really efficacious remedy for pourridie is by removing and burning all roots showing traces of the disease. Erinnose may be treated like mildew—that is, by repeated applications of sulphur.

A REPORT on the appearance of the Hessian fly in this country, by Mr. Charles Whitehead, the Agricultural Adviser, has been issued by the Agricultural Department of the Privy Council. The fly was first seen in 1886 in Great Britain, and in that year did some harm to wheat and barley plants in England and Scotland. In 1887 it was noticed in twenty counties in England and ten in Scotland, wheat and barley crops being considerably damaged by its action. The weather during the summer of 1887 was hot and dry, like that which normally prevails in America, and was presumably favourable to the development and progress of the fly. During 1888, when the summer was unusually wet and cold, very little was heard or seen of the Hessian fly either in England or Scotland. But during the early months of the present year the temperature was high and the rainfall small, and from the reports received by the Agricultural Department the infested area has largely increased in England. In Scotland it does not appear to have made so much progress. Still it is present in many Scotch counties. The actual amount of injury to the crops is slight, and, so far as can be ascertained, is not in any instance so important as that caused in some cases in 1887. It is most probable that the injurious operations of the insect have been checked by the wet, cold weather which has followed the abnormal heat of May, and the warmth and dryness of June. When a cycle of hot summers occurs, it may happen that the ravages of the Hessian fly may be general and calamitous. Mr. Whitehead therefore urges the desirability of careful watching and the prompt adoption of simple methods, which he describes, for preventing the increase of the pest.

The *Industrie Textile* has a long account of the treatment of wild silks (that is, those which are furnished by silkworms other than those of the domesticated *Bombyx mori*) in their native countries. In India there are no less than fifty varieties of silk-bearing insects, the most important of which is called tussur, that is, "the weaver's shuttle." The caterpillar, like the moth, is of a great size, and feeds upon more than thirty species of plants. The cocoons of the tussur, which make their appearance twice in the year, are found attached to the branches of trees in the jungle in large oval masses. The caterpillar lives from thirty to forty days, and then weaves its cocoon. In four or six weeks from this time the moth comes out and lays eggs from which comes a second generation of caterpillar. These wrap themselves in the cocoon, and remain hanging to the trees throughout the rainy season—that is, for seven or eight months. The cocoon, which is about four times the size of that of the mulberry silkworm, is composed of a double and interrupted thread of about 1400 metres in length. The thread is impregnated with uric acid of sodium, which must be removed by the aid of an alkaline wash before the thread is unwound. The tussur is tended with great care; in fact, for centuries various religious usages have been employed in rearing it. The moth, which is a large insect of a brownish colour, having its wings beautified by four transparent eyes, is venerated, and may be only approached by people of a certain caste. Unlike the tussur, which has been domesticated in India for some thousands of years, the cocoons of the other species are collected in the jungle. Amongst these is the *Attacus cynthea*, which feeds on the castor-oil plant, and of which the cocoon is white. Other species are the *Antheræa assama* and the *Cricula trifenestra*, which lives on the mangrove tree and spins a cocoon of a bright golden colour. The most important Chinese species is the *Antheræa pernyi*, which is cultivated in the province of Sze-chuan. In China also is found the most beautiful of all moths, the *Attacus altas*, which spins an enormous cocoon, covered at both ends with a very thick silk, known as Fagara silk. In Japan are the *Ailanthus* caterpillar, and the *Yamanai*, which till lately was reserved for the exclusive use of the Mikado, and the exportation of the eggs was an offence punishable with death. At present attempts are being made to cultivate this species in France, and it is believed they will be successful.

Messrs. Blackie and Son will publish immediately a translation of the well-known "Organische Chemie" of Prof. Bernthsen, of Heidelberg. The translation is by Dr. George McGowan, University College, Bangor, and the original text has been specially brought up to date for this edition by the author, who has throughout shown keen practical interest in the perfecting of the English edition.

The Royal Meteorological Institute at Utrecht has just published a valuable atlas of twenty-two charts, containing the results of observations in the Indian Ocean, for the separate months of December, January, and February. Some portions of the ocean are naturally without data, but the amount of material dealt with may be judged of from the fact that 51,799 observations have been used in the construction of the wind chart for December. The temperature of the sea-surface is represented by isotherms drawn for every 2° C., and shows in certain regions, *e.g.* near the Cape of Good Hope, considerable differences of temperature in the various months. The currents are plotted in 1° squares, in two colours, showing the resultants of the currents setting towards the west and of those towards the east, separately, together with the number of observations from which they are calculated. Atmospheric pressure is represented by isobars drawn for every 2·5 mm. They show an area of high pressure between lat. 30° and 35° S. and long. 80° and 90° E.; in January there are two centres of high pressure, at long. 55° and 85°. The temperature of the air is exhibited by isotherms for every 2° C. The difference between the air and sea temperature is generally small, but the excess of the latter sometimes amounts to 5° C. The wind is represented by roses showing the relative frequency for direction (only), arranged according to homogeneous areas, combining the same prevalent winds in irregular spaces. Other charts show specific gravity, rain, percentages of storms, and other interesting information.

The third session of the Edinburgh University Extension Summer Vacation Course was held, as before, during August, at Granton Marine Station, through the kindness of Dr. Murray, Director of the *Challenger* Expedition, and of Mr. Irvine, of Royston. The courses of botany and zoology were conducted, as last year, by Prof. Geddes and Mr. G. A. Thomson. This year each course was divided into an elementary and an advanced section, the former dealing with Vertebrates and Phanerogams, the latter with Invertebrates and Cryptogams. Prof. Geddes also delivered a course of twenty lectures on sociology. Some twenty-five or thirty students attended. All the courses were supplemented by demonstrations in the field and on the shore, and by visits to public and private gardens and to the Museum.

In the abstract of Dr. Stefan's paper on "Ice Growth" (Nature, August 22, p. 400), the third paragraph should read as follows:—"The theory gives for the thickness (h) of ice formed in the time (t) the following formula, which is approximately correct—

$$h^2\left(1 + \frac{cf}{3\lambda}\right) = \frac{2kT}{\lambda\sigma}.$$

In this formula (c) is the specific and (λ) the latent heat of ice; (k) is the coefficient of conduction, (σ) is specific gravity, (f) is the temperature at the surface of the ice at the time (t), (T) the sum of cold for the same time; the last is the sum of the temperatures counted downwards from 28° F., or the freezing-point of sea-water, from the commencement of ice formation up to the time (t)."

The additions to the Zoological Society's Gardens during the past week include a Common Peafowl (*Pavo cristatus* ♂, white variety) from India, presented by Mr. Richard Hunter; a Manx Shearwater (*Puffinus anglorum*) from Essex, presented by Mr. J. M. Wood, C.E.; a Lesser Razor-billed Curassow (*Mitua tomentosa*) from Guiana, presented by Mr. G. H. Hawtayne, C.M.Z.S.; a Louisianian Meadow Starling (*Sturnella ludoviciana* ♀) from North America, presented by Mr. Newton Hayley; a Turtle Dove (*Turtur communis*), European, presented by Mr. C. W. Cousins; five Herring Gulls (*Larus argentatus*), British, presented by Sir Richard Nicholson.